International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2017 vol.17 N12, pages 969-976

Using plaxis software for the forecasting of karst-suffusion failures in carbonate eluvium

Latypov A., Zharkova N., Ter-Martirosyan A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© SGEM2017. All Rights Reserved. Carbonate eluvium is suffusion unstable soil, where voids and cavities can be formed. This can lead to adverse effects and disasters in the constructions of buildings and structures. This article presents the results of using the Plaxis Software for the determination of the critical depth and critical diameter of the cavities in which the possible collapse. The total thickness of the carbonate eluvium exceeds twenty meters in the study area. The calculation model of the cavity growth included the geometric model of engineering and geological section, complete with physical and mechanical properties (density, internal friction angle, cohesion, modulus of deformation). The cavity was modeled in the form of two nested cylinders. Internal is a cavity, external - weakened soil zone. This approach revealed that in the studied area the dangerous depth is up to seven-eight meter, and the average value of the critical diameter is about two meter. And the most dangerous for the construction of the building will be the appearance of the cavity under a corner of the building. The research results showed good agreement with the actual observed failures in the study are.

http://dx.doi.org/10.5593/sgem2017/12/S02.123

Keywords

Carbonate eluvium, Karst, Plaxis software, Suffusion

References

[1] Zharkova N., Latypov A., Shevelev A., & Khuzin I. Development of a permanent geological environment model of Kazan city aimed to solve various engineering-geological problems (Russia), IOP conference series: Earth and environmental science vol. 33 (1), 012048, pp 1-6, 2016.

[2] Pichugin N.S. About the genesis of dolomite eluvium in Paleozoic of Russian Plain, Metallogeny of sedimentary and metamorphic rocks, Russia, pp 124-132, 1966.

[3] Bykov V.N. The role of carbonate eluvium in the structure of carbonate oil and gas strata, Hydrogeology and karstology Vol.6, Russia, pp 5–20, 1975.

[4] Anfimova S.V. Izotov D.N. Technical report on the results of geological engineering survey "The cottage settlement in the place 'village of Tsaritsyno" of the Soviet district of Kazan (OJSC " KazTISIz ")", Vol.1, Russia, p 47, 2008.

[5] Simon D.E., Elwell J.H., Sendlein L.V.A., Lemish J. Measurement of physical and chemical changes induced during weathering of a carbonate rock unit, Iowa Acad. Sci., USA, Vol.76, pp 320-329, 1969.

[6] Gareev K.R. Explanatory note to the report "Conducting gravimetric works to assess the affected area by exogenous geological processes (LLC "TNG-KAZANGEOFIZIKA")", Vol.1, Russia, p 37, 2008.

[7] Mirzoev K.M, Stepanov V.P. Deep karst and modern movements of the earth's surface in Tatarstan, Georesources, Russia, Vol.1 (18), pp 44-47, 2006.

[8] Gotman N.Z. Problems of construction projects design in conditions of karst risk, International symposium “Environemental safety and construction in karst areas, Perm, 26-29 May 2015”, Russia, Vol.1, p.p. 30-37, 2015.

[9] Khomenko V.P. Negative effects of suffusion on industrial and civil construction projects, Promyshlennoe i Grazhdanskoe Stroitel'Stvo, Russia, Vol.10, pp 10-11, 2004.

[10] Engineering protection of territories, buildings and structures from dangerous geological processes, Code of Regulations 116.13330.2012, Russia, p. 65, 2012.